MATLAB Workshop: DIY Examples

Engineering Peer Helper Program

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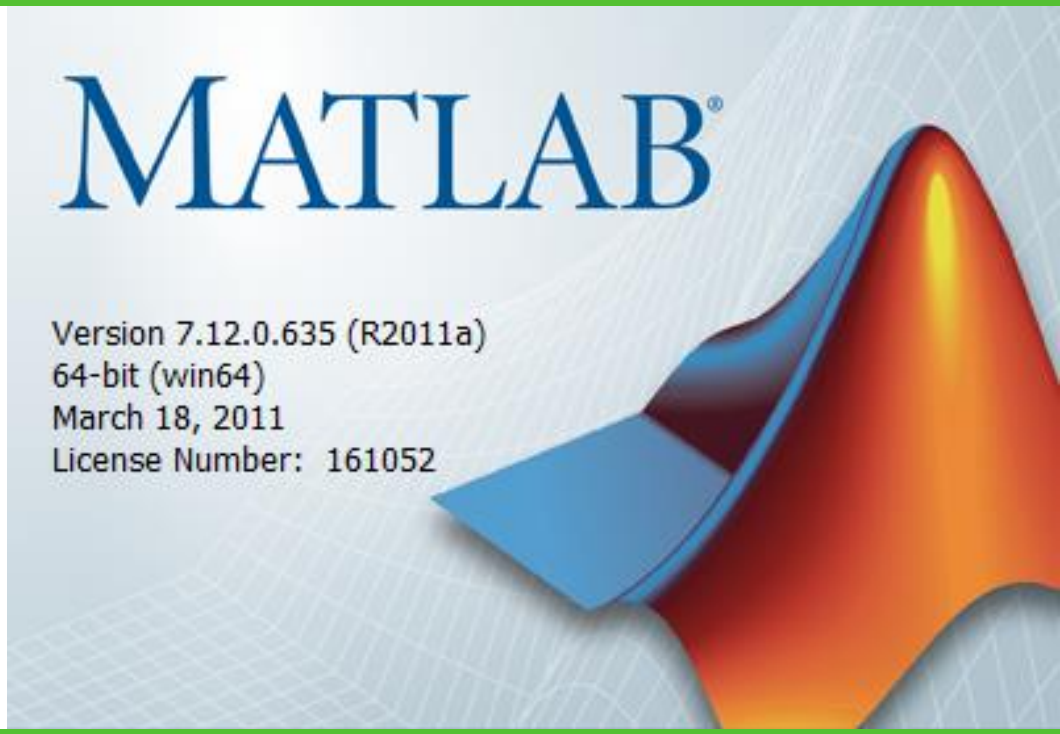

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Contents

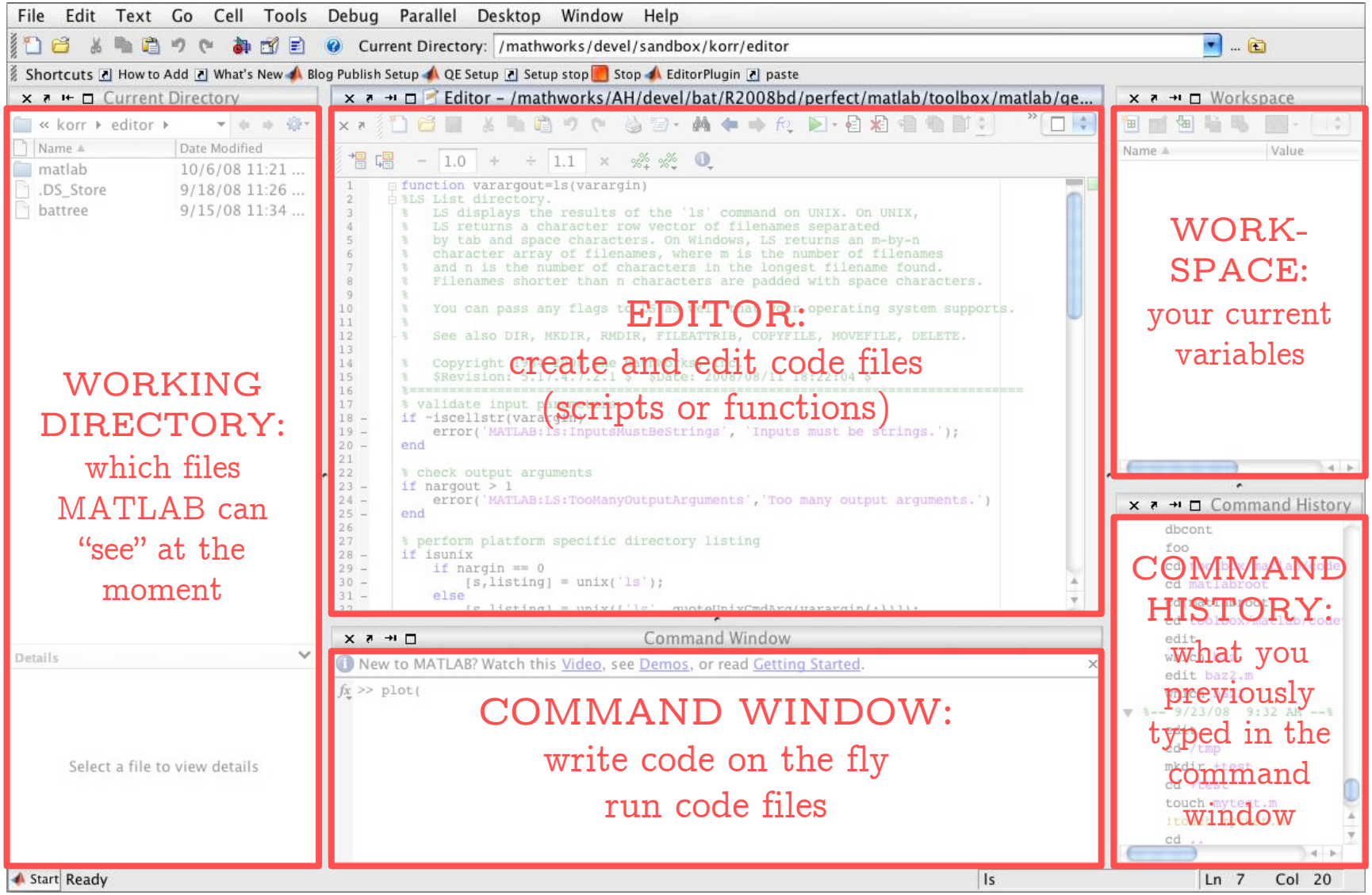
- What is MATLAB?
- Getting Started
- Review of Getting Started
- DIY Examples:
  - Gas Equation
  - Coin Toss Live Plot
  - Fibonacci numbers
  - Discovering π

Review: What is MATLAB?

MATLAB is…

- an "integrated development environment"
- used for:
  - exploring data on the fly
  - modeling systems (engines, maps, images, …)
  - building research tools
- used by:
  - engineers
  - scientists
- more powerful than Excel
- but easier than programming in C

Review: Getting Started



Review: Resources

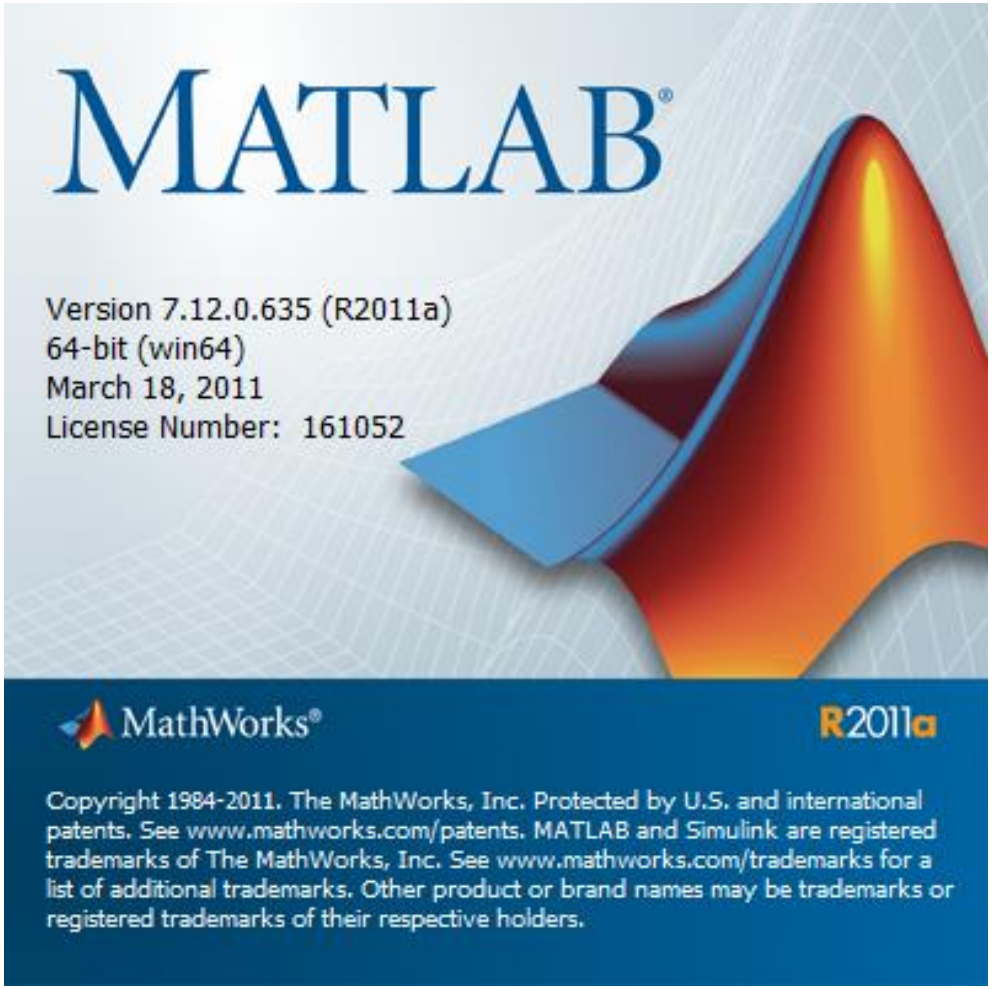
Getting Started

- Tutorial: MathWorks Getting Started Guide
- Basic Syntax: Reference Card, example .m files
- Specific Tasks: Google " (doing X) in MATLAB "

Debugging

- " `help <function>` "
- Guide to error messages
- StackOverflow
- Google
- Peers, TAs, Profs

Review: Getting Started



Example: Gas Equation

An arbitrary sine function:

$$S = M \sin(2\pi t + \phi)$$

Values for M and t:

$t = 0 \ldots 5 \ (\Delta t = 0.01)$

$M = [1,2,4]$

→ For each M, and constant $\phi = \frac{\pi}{2}$, plot the value of $S(t)$.

Label axes appropriately.

Example: Coin Toss Live Plot

- Create a script which models 2000 coin tosses
- Plot the *running proportion* of heads for tosses `t = 1:2000`
- Edit the script to so that 10 tosses are plotted at a time, with a small delay between each update

Some useful functions might be:

`round, rand, mod, drawnow, pause`

Example: Fibonacci Numbers

- Create a function to check if a number is a Fibonnacci number
- Check the numbers `n=1:10000` and show the result graphically

Hint: How are you going to check if a number is a Fibonacci number?

Some useful functions might be:

`sqrt, round, if, else`

Example: Discovering π

Consider a unit circle in the 2D Cartesian plane with

$$x \in [-1, +1] \quad \text{and} \quad y \in [-1, +1].$$

→ Write a function to test if a coordinate pair `x,y` is in the unit circle

→ Randomly select N points in this space and use the ratio:

$$\frac{\#(x, y) \in \oplus}{\#(x, y) \in \boxplus}$$

to estimate π.

→ How does this estimate change with N?

Hint: What is the equation of the unit circle?

Hint: What is the area ratio between a unit circle and a unit square?

References

The examples in this tutorial were inspired by

MATLAB for the Absolute Beginner

by Arvind Ravichandran.